



MSTA

Dedicated to Quality
Science Education

Volume 7

Number 9

Newsletter

HIGH SCHOOL LAB WORK IS BECOMING AN ENDANGERED SPECIES

Copies from the Missoulian 11/21/88; by Boyce Rensberger and Barbara Vobejda -The Washington Post

The most effective method ever devised for teaching science-

ence-having students do experiments in a classroom laboratory to enable them to see the results -- is slowly vanishing from American schools.

The proportion of science classes that use *hands-on* activities has dropped between 15 percent and 27 percent, depending on the grade, during a recent 10 year period, according to a nationwide study done for the National Science Foundation.

The result is obvious to David Walker, a teaching assistant at the University of Maryland who supervises labs for students in

Introductory chemistry. They don't know how to use Bunsen burners, pipettes-- we would expect them to know

how to use a balance, burettes to titrate, read volumes, how to light Bunsen burners, Walker stated. *You could talk to any teaching assistant and they would agree that students don't have very good lab skills.*

Graduate student Dan Hatten has seen the same problems in the physics lab courses he teaches at the university. *A lot of them are not good with equipment....They lack a sense of wiring simple circuits from a diagram which is quite straightforward.* He said the students are missing the scientific common

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sense they should be gaining from high-school physics courses.

Walker and Hatten are witnessing first hand the results of what a number of studies report as a dramatic decline in the amount of time high school students spend in labs. In 1977, for example, 53 percent of the high school science classes surveyed included some form of laboratory exercise. When the survey was retaken in 1985-86, that share had dropped to 39 percent. Most science educators consider the higher figure far too low.

The cutback comes at a time of growing concern on the part of science and education groups over the poor performance of American students on standardized science tests, especially compared with students in other countries. These groups have urged schools to devote more time and money to science labs in the classroom, but their efforts often have been thwarted by a variety of

factors.

In Baltimore County, for example, school officials banned a common experiment requiring students to scrape a few skin cells from inside their cheeks and study them under a microscope. Anne Arundel County in Maryland students no longer prick their finger tips to draw blood cells for similar study or for blood typing. The reason in both cases is fear - unsupported, ironically, by scientific evidence that the experiments will spread AIDS.

Increasing attention to the question of animal rights has brought pressure to find alternatives to laboratory dissection, with some state legislatures proposing bans on dissection.

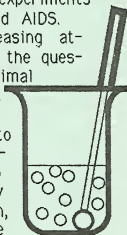
Many school systems have given up physics and chemistry experiments that require intense heat, such

as from a Bunsen burner or a hot plate, because liability insurance companies consider the risk too great. Anne Arundel County dropped a chemistry experiment using mercuric oxide several years ago because of concerns about the toxicity of mercury.

In some cases, the lack of lab work may be a by-product of the shortage of qualified science teachers. Studies have shown that many science educators are not teaching in the field in which they specialized, making it more difficult for them to conduct a solid laboratory course.

Another force pushing schools away from science labs is the high-technology allure of computers. Although experts in teaching say some uses of computers are valuable, they note that trivial applications - far more common - are hurting science education.

Amount the worst example, experts say, are computerized simulations of experiments



that students used to do themselves.

For instance, some schools have abandoned chemistry experiments in favor of simulated experiments on a computer that displays drawings of test tubes and chemicals. Experts say such programs are little more than a cross between a video game and a text book that turns pages at the touch of a button.

Tutor in a box, one National Science Foundation (NSF) official derisively call such efforts. *This kind of thing is no substitute for a teacher or for a real lab*, said George W. Tressel, director of NSF's division that develops materials for science education.

It's hard to learn science without actually touching it, doing it, seeing how the experiment really comes out, Tressel said. *There's a real problem with the weakening of hand-on science education.*

Similarly, California students who don't want to dissect a frog in biology class, for instance, can now invoke a new state law that gives them the

alternative of simulating a dissection using crude computer generated graphics of a cut-up frog.

Critics say the exercise gives a misleading impression of what the innards of a frog are like. Aside from being depicted in false colors and crude, angular diagrams, the computer frog has no skin to cut open, no bones, no nervous system beyond the brain and spinal cord, and no circulatory system except a heart and the largest blood vessels. Only the abdomen can be dissected, preventing students from examining some of the frog's most remarkable adaptations, the powerful musculature of its jumping legs and the long sticky tongue that catches insects.

Specialist in science education say lab work is valuable for several reasons. For one thing, most students remember more of what they learn by doing than of what they read in a book or hear in a lecture. Ray Hannapel, director of NSF's research on teaching and learning, cites the old Chinese proverb: *I hear*

and I forget. I see and I remember. I do and I understand.

It's the credo of anyone in science that doing experiments and field work is the grist of science. Hannapel said. *You do the experiment and you remember much longer and more vividly than if you simply read about it.*

Another value of lab work, scientists say, is that it shows students that science is fundamentally unlike any other supposed source of knowledge. It advances not on lofty pronouncements by authoritarian figures but on data hard evidence of real events that happen in experiments or under rigorous observation of the natural world.

The concerns were heightened by a recent national survey on science achievement among third seventh and 11th graders, in which fewer than half of seventh grade science teachers said they had access to a general purpose laboratory. Among students, half of the seventh graders said they never got to do experiments even in groups.●



MOON KIT AVAILABLE

A new kit of slides and information about the Moon has been released by the Astronomical Society of the Pacific. The 18 slides in the kit show many different aspects of the Moon, including close-ups of craters, lava tubes and mountains, as well as a map of the far side of the Moon and photos from the Apollo 11 landing. The slides are accompanied by a 24-page book with captions, background information, projects, activities and an introductory reading list. Among the topics covered in the book are a guide to the phases of the Moon, explanations of the names of full moons (including blue moon and harvest moon), and a description of the lunar surface. The booklet also has tables of the automated and manned lunar probes and a chart for telling time by the Moon.

To order, send \$24.45 (postage and handling included) to the ASP, Moon Kit Dept. NPK, 390 Ashton Avenue, San Francisco, CA 94112.



NEW PROVISIONS PROVIDE DIRECTION FOR METRIC TRANSITION

A renewed U.S. Government commitment to the metric system of measurement promises to help American companies in international markets and to provide the opportunity to restart our commitment to the use of the metric system in science and mathematics classrooms.

Many U.S. businesses and industries have been hobbled by the need to manufacture and market products in different dimensions—one for U.S. consumption and one for the rest of the world. The recently enacted Omnibus Trade and Competitiveness Act of 1988 addresses the problem by moving the United States closer to the metric system, now used by most of the world's population.

The trade act, signed into law August 23, states that the metric system is "the preferred system of weights and measures for United States trade and commerce." It directs the federal government to provide leadership in metric conversion and calls for a preference in government purchasing



for metric products. The act requires federal agencies to use the metric system, wherever it is practical to do so, in procurements, grants and other business-related activities by October 1, 1992. The agencies will notify grantees, contractors and suppliers of the new requirements and of time schedules for meeting the government's deadline.

Research shows that concerns about adverse impact of metric on small business and workers are unfounded, the U.S. Department of Commerce's Office of Metric Programs states. These and other research findings demonstrate that there are no longer valid arguments for delay or opposition to completing a metric transition.

For further information, contact the U.S. Department of Commerce, Office of Metric Programs, Washington, DC 20230, (202) 377-3036.

EARTH SCIENCE INTERNSHIPS

Secondary school teachers can apply for earth science internships. The program is run by the National Center for Earth Science Education. In past programs, interns have worked on the NOAA ship Heck, developed a lab manual and written a K-12 syllabus. For information, write Andrew J. Verdon, Jr., American Geological Institute, 4220 King Street, Alexandria, VA 22303 (703) 379-2480.

ARE YOU A MAD SCIENTIST?

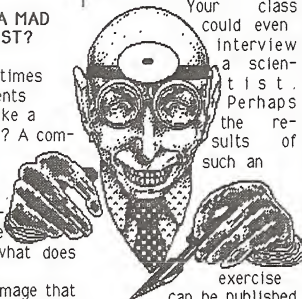
How many times have your students said you look like a *mad scientist*? A common retort is, *I'm not angry; I'm very happy*. This type of response may be humorous, but what does it teach?

The public image that scientists are strange, narrow-minded recluses at best, and at worst people to be feared, persists despite the many well-designed pre-college courses offered in

our schools.

Should we consider the public's image of science as we teach? When we take a field trip to a lab, why don't we ask the scientists what they like about their work, what their life-style is like, why they became scientists? When a student tells us we look like a mad scientist, why don't we use that as a launching point for a class project? Your class can develop a questionnaire that explores misconceptions that people have about scientists. The questionnaire can be sent to other students, parents, local business and the press.

Your class could even interview a scientist. Perhaps the results of such an



exercise can be published in the MSTA Newsletter.

In any event, do not let students get away with cheap quips about mad scientists. Do what you can to change the public image.

Alcohol Burners: A HAZARD

Five Injured in Explosion in Jersey

Science Class is the headline from the *New York Times*, October 28, 1987, as reported in the *Laboratory Safety Workshop Newsletter*. According to the article, "Five students were injured, two of them seriously, in an explosion here today during a science class at Collingsworth Junior High School...two girls, aged 13 and 14, were hospitalized in stable condition after the explosion of an alcohol burner at the school..."

Reports of accidents like this should remind elementary and junior high teachers in particular of the dangers inherent in the use of alcohol burners. Once used widely in the pre-high school grades, alcohol burners are now known to be extremely dangerous and should not be used in classrooms of any level. The danger lies in the fact that the wick sometimes carries the flame into the burner, igniting the alcohol and causing the container to explode. Substitutions in experiments requiring the use of heat might be candles or other



less dangerous heat sources. Most experiments on the elementary school level will be just as successful despite the substitution. You might also want to point out the dangers of alcohol burners to the budding scientists in your class who might be receiving chemistry kits for home use. Many of these kits still contain these burners.

SCIENCE SKILLS AT LOW LEVEL

Education Week reports that science achievement levels, according to a study released in September, are *distressingly low*. Conducted by the National Assessment of Educational Progress, the authors suggest that the study may signal a need for fundamental changes in the way the subject is taught. Students in grades 3, 7 and 11 were included in the study.

On the elementary level, the study shows that 30 percent of the 9-year-olds involved in the survey *have not yet developed some understanding of scientific principles and a rudimentary knowledge of plants and*

animals. The test included this problem: 3 blocks, A, B and C are of equal size. Blocks B and C float on water; A sinks to the bottom. Which one is true: A weighs more than B; B weighs more than C; C weighs more than A. Only 27.6 percent of the 9-year-olds could correctly apply basic scientific information to solving the problem.

The report points out that responses from the students indicate that "science instruction continues to be dominated by teacher lectures and textbooks." Hands-on activity, out-of-school science activity and home support are all advocated to help remedy the situation.

Adding insult to injury, relatively few students at any age said they considered science useful or relevant to their own lives.

Copies of the report are available for \$14, including shipping and handling from: The National Report Card, P.O. Box 6710, Princeton, NJ 08451-6710. For 3 or more copies, a 50 percent discount applies. You can also borrow a copy from Bob Briggs, Science Specialist, Office of Public Instruction.

AAAS PUBLISHES LIST OF BEST CHILDREN'S SCIENCE BOOKS

The American Association for the Advancement of Science published its annual list of best children's science books in its November/December issue of *Science Books and Films*. All books were reviewed in terms of accuracy, quality, scope and value. This guide is helpful to librarians and those searching for gift suggestions. You may purchase copies of this issue for \$8.50 from AAAS, Marketing Department L2, 1333 H St., NW, Washington, DC 20005.

SSIP CONTEST LETS YOU REACH FOR THE STARS

Recently, the NSTA mailed flyers describing this year's Space Science Student Involvement Program. If you have not seen it, write NSTA, 1742 Connecticut Ave., NW, Washington, DC 20009 and ask for a copy. The SSIP has been a very successful contest for many years.

Students entering this contest propose experiments that can be performed on board a

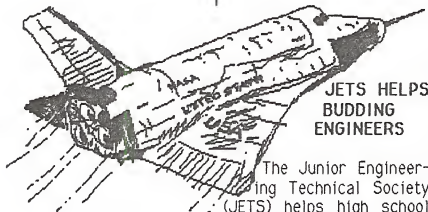


space station, in a wind tunnel or in micro-gravity. There is even room for the artistically creative; one contest invites students to research and illustrate their concept of the first human settlement on Mars.

NASA and the NSTA have worked together to create imaginative contests that stimulate learning. What makes this contest unique is that the students do not perform the experiments; they come up with the idea and propose the experiment.

design a battery-powered device. This contest allows kids to have fun with applied science. The top prize winner receives a \$10,000 scholarship.

Encourage your students to enter. The deadline is February 1. For entry materials, write Duracell Scholarship Competition, National Science Teachers Association, 1742 Connecticut Ave., NW, Washington, DC 20009 (202) 328-5800.



JETS HELPS BUDDING ENGINEERS

The Junior Engineering Technical Society (JETS) helps high school students interested in pursuing a career in engineering. It administers aptitude tests, runs a successful competition and gives guidance. Let your students know about this organization. Write JETS, 1420 King Street, Alexandria, VA 22314-2715 (703) 548-JETS

KIDS GET A CHARGE OUT OF THIS CONTEST

The NSTA and Duracell jointly sponsor a yearly scholarship competition with the goal of encouraging high school students to use their imagination to invent and

GIANT OXYGEN FACTORIES

An invention that converted carbon dioxide back into oxygen would be hailed as quite a breakthrough...and we already have it in trees. Replacing old trees with young, vigorously growing ones contributes not only to wood supply, but also to the world's oxygen recycling system. Forests act as giant oxygen factories.

Scientists calculate that, for every ton of wood a forest grows, it removes 1.47 tons of carbon dioxide from the atmosphere and replaces it with 1.07 tons of oxygen. Humans, by comparison, require for respiration only about a pound of oxygen a day, an amount so modest that actively growing grass on a 50 x 50-foot lawn releases enough oxygen day by day to meet the daily needs of a family of four. And so does an average size tree.

So a healthy forest is a silent-running air replenisher. Trees grow through a process called photosynthesis—meaning “putting together with light.” Water and minerals absorbed by tree roots are carried to the leaves and come into contact



there with chlorophyll and air. Sunlight passing into the leaf strikes the chlorophyll, giving it the energy to break the water molecules apart. Oxygen from the broken water molecule is "exhaled" by the leaf through the process of transpiration. Hydrogen from the water molecule combines with simple carbon compounds built up by carbon dioxide taken from the air. The result is sugar, which the tree uses as food.

A tree's contribution to the oxygen supply is a relatively temporary thing. As trees age and decay, their photosynthetic production declines and they release less and less oxygen. Eventually, decay reverses the process, using oxygen and releasing carbon dioxide into the atmosphere.

**ANNOUNCING: THE
AMERICAN CHEMICAL
SOCIETY-NSTA HIGH
SCHOOL CHEMISTRY
TESTING PROGRAM**

ACS-NSTA cooperative high school examinations are prepared by committees of experienced high school teachers.

A completely new

examination has been written for advanced high school chemistry.

A scrambled version of the 1987 regular high school test is now available.

Norms are available for all except 1988 tests. Separate tables of percentile ranks have been prepared for several types of high school classes, so you can compare performance of your students with that of students in similar courses nationwide.

Users of new tests are urged to submit data to establish national norms.

As of January 1, 1988, the ACS DivCHED Examinations Institute address is: Oklahoma State University, 107 Physical Sciences, Stillwater, OK 74078-0447, (405) 624-5947.

**Science Sectionals
Needed**

MSTA is still looking for people to offer science sectionals for the '89-90 MST A Convention. All presenters will be paid a \$25.00 honorarium. Contact John Cannon MEA-IPD Convention 1232 East Sixth Avenue Helena, Montana 59601.

**The mind is a
strange machine
which can combine
the materials offered
to it in the
most astonishing**

way...Bertrand Russell



**New Magazine
for Science**

TIES, a new magazine primarily for technology educators, also seeks readership by science teachers who are interested in the kind of articles which will regularly appear. Science teachers interested in a strong hands-on component to science education (e.g., Science Olympiad) are welcome to subscribe. Subscriptions are FREE. Write David L. Diccio, Associate Editor, TIES, 154 Hamilton Blvd., Struthers, OH 44471-1446, or call (216) 755-2710.



Marine Ecology & Technology Workshop

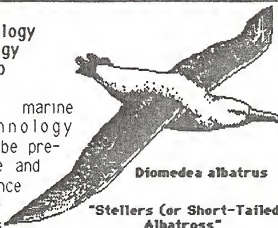
Two-week marine ecology/technology workshops will be presented for middle and high school science teachers in the Florida Keys during the summer of 1989. Funded by NOAA's National Undersea Research Program, all accepted applicants will receive full scholarship support. Graduate college credit is available. For further information contact Marine Resources Development Foundation, P.O. Box 787, Key Largo, FL 33037, (305) 451-1139.



Tetraolita
"Thatched Barnacles"
25-50mm in diameter



Lepas
"Goose Barnacles"



Diomedea albatrus
"Stellers (or Short-Tailed)
Albatross"

Leonard E. Porter Receives Presidential Meritorious Service Medal

One of our own has received special recognition from the President. Part of the award letter is below:

The President of the United States takes pleasure in presenting the Meritorious Service Medal to Colonel Leonard E. Porter, United States Marine Corps Reserve, for service as set forth in the following citation:

For outstanding meritorious service as Director, Marine Enlisted Commissioning Education Program, Preparatory School, San Diego, California, Colonel Porter provided dynamic leadership and displayed superior managerial skills in the planning, development, coordination, and execution of the Program. Without a formal Letter

of Instruction, host or budget, he aggressively pursued the goal of preparing Marine Enlisted Commissioning Education Program selectees for the academic rigors of university study. Faced with limited funding, he borrowed used textbooks from various programs within the Department of the Navy, and acquired office and classroom supplies. Colonel Porter developed a demanding curriculum and recruited qualified educators from the Marine Corps Reserve to serve as instructors. Colonel Porter's outstanding leadership, vision, and unwavering devotion to duty reflected great credit upon himself and were in keeping with the highest traditions of the Marine Corps and the United States Naval Service.

"If the aim is to make invention creative and humane, knowledge of the humanities must be coupled with an understanding of the characteristics of scientific inquiry and technological change. Liberal education must define scientific literacy as no less important a characteristic of the educated person than reading and writing."

— Commission on the Humanities.





How to Transplant Seedlings Into Flats*

Introduction:

The purpose of this module is to assist you in developing the skills needed to transplant a variety of types of seedlings from trays to larger trays or flats. Before starting you should be able to identify seed leaves, true leaves, apical bud, stem and root systems and have specific knowledge of the seedlings you'll be transplanting. You should be able to obtain 10 healthy plants from every 12 seedlings you transplant.

Materials:

flats, 12 x 30 x 45cm
wooden plant markers
peat moss
sterile potting soil
vermiculite
5-10-5 dry fertilizer
metal measuring spoons
metal fork
healthy seedlings

Procedure:

1. The soil used in transplanting is a mixture of five ingredients: equal portions (by

volume) of peat moss, vermiculite, 2 portions of coarse builder's sand and potting soil, and 30 ml of fertilizer per 6 liters of soil mix.

2. One day before transplanting water each tray of seedlings with water at 200 C. Remember the soil should be moist, not soaked.

3. Place a single sheet of newspaper in the bottom of your flats. This will prevent soil from leaking out.

4. Add the soil mix to the flats, smooth surface to a depth of about 7-8 cm. Prepare one flat for each type of seedling.

5. Inspect seedbed in which the seedlings have been growing. If soil is dry, water it lightly. If too wet, wait a few hours.

6. Scoop out holes about 3 cm deep and 10-12 cm apart. Allow 10-12 cm between rows.

7. Loosen soil around each large seedling with a fork. Insert a tablespoon about 5 cm from the base of the stem. Start with the seedling at the end of each row. Use your free hand to disentangle any roots. (Don't rip them out!)

8. Support the plant with the spoon and one leaf, keeping as much soil around the roots as possible. (*Don't hold a plant by its stem!*)

9. Place the seedling in one of the holes in the flat, while avoiding disturbing the roots.

10. Cover the root clump with 1-2 cm of soil. The seedling should be upright and stand by itself.

11. Any seedlings that appear stunted, spindly, or wilted should be discarded.

12. When all the seedlings have been transferred, add more soil to the flat. Smooth the surface around the seedlings and the soil should only be to the original soil line.

13. Press the soil lightly around each seedling and water the flat.

14. For medium seedlings the holes should be 1 cm deep and 10-12 cm apart. Remove the seedling with a teaspoon at about 4 cm from the base of the seedling.

15. To transplant small seedlings make holes 1 cm deep and 3 cm apart with the pointed end of a pencil. Remove the small seedling with a plant marker about 1 cm from the base, supporting the seedling by holding one of its leaves.

16. Transfer to one of the small holes in the flat. Do not add more soil to the flat, but gently press soil around each seedling.

17. Identify each flat with

the name, number of seedlings, and dated transplanted.

18. Place all freshly transplanted flats in the shade for 24 hours. During this period, keep the plant moist, but do not over water.

19. Plants should receive 14-16 hours of light per day, 60-70 per cent humidity, and temperature control from 180 to 240 C.

20. Rotate the flats 180 degrees daily, so that the seedlings will grow straight. Plants should be watered in the morning, during the first one-quarter to one-third of the light period.

21. Seedlings are ready to transplant from flats to pots when the plant has reached twice the height of the seedling. Measure from the soil line to the apical bud.

***Adapted from the American Institute of Biological Sciences, Project Biotech**

This is the 2nd in a series of articles to help you grow plants for school or home use with better results.

**Richard A Menger, MST
Green Jeans Horticulture
Outdoor Classroom Project
Baker High School
(406)778-3329**



2/24/89
TODAY'S DATE

11:19:05 AM
THE TIME

58198
TOTAL AIDS
CASES

27761
TOTAL AIDS
DEATHS

THE AIDS CLOCK

AIDS IS NOT A PROBLEM
THAT WILL GO AWAY THAT EASILY

24 Ways to Have Children



Source of 1st Gamete	Site of Fertilization	Site of Pregnancy	Sperm		Ovum	
			Husband	Donor	Wife	Donor
Wife	Wife	Wife	Natural (1)	AID (2)		
		Surrogate	ND (3)	ND (4)		
	Surrogate	Wife	ND (5)	ND (6)		
		Surrogate	ND (7)	ND (8)		
	In vitro	Wife	IVF/ET (9)	ND (10)		
		Surrogate	ND (11)	ND (12)		
Husband	Wife	Wife			Repeat	ND (13)
		Surrogate			Repeat	ND (14)
	Surrogate	Wife			Repeat	Embryo wash out & transfer (15)
		Surrogate			Repeat	Surrogate (16)
	In vitro	Wife			Repeat	ND (17)
		Surrogate			Repeat	ND (18)
Ovum Donor	Wife	Wife	Repeat	ND (19)		
		Surrogate	Repeat	ND (20)		
	Surrogate	Wife	Repeat	ND (21)		
		Surrogate	Repeat	ND (22)		
	In vitro	Wife	Repeat	ND (23)		
		Surrogate	Repeat	ND (24)		

Sperm Donor: Repeat of Above Methods

AID = Artificial insemination by donor
 IVF = In vitro fertilization
 ET = Embryo transfer
 ND = Not done as yet

Distinguished High School Science Teacher Fellowship Offered

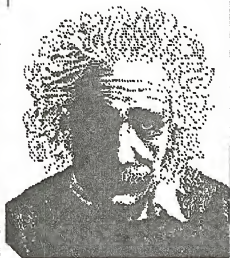
The University of Montana, in cooperation with the Office of Public Instruction, is accepting applications for the 1989 Distinguished Montana High School Science Teacher Award. Both junior and senior high school science teachers are eligible. The teachers selected will receive an eight-week summer research fellowship for the summer of 1989 at the Solar Research Institute in Golden, Colorado. In addition to the opportunity to work with first-rate scientists, the fellowship includes a \$5,000 stipend and a \$1,000 relocation allowance. Research may be done in a wide range of disciplines including biology, chemistry, physics, computer sciences and engineering. In short, this is a grand opportunity

for Montana's science teachers.

For further information and/or applications, please contact:

David Pepi
Education Department
University of Montana
Missoula, MT 59812

Bob Briggs
Science Specialist
Office of Public Instruction
State Capitol
Helena, MT 59620



**Each excellent
thing, once
learned, serves
for a measure of
all knowledge.**

Sir P. Sidney

Last Call !

MSTA is sending a charter bus to Seattle for the NSTA Conference so that you can enjoy the trip at small cost. The round trip cost will be \$75 which is half of a commercial bus ticket. There will be three pickup points. The bus will leave Bozeman High School at 7:00 am Wednesday, then Helena High School at 9:00 and finally Sentinel High School in Missoula at 11:00 am.

You can reserve a seat by sending a check to Gil Alexander at 504 Dearborn, Helena, Montana 59601. Make the check out to MSTA. Your reservation for a seat can be secured for \$20 and you can pay the rest prior to boarding the bus. The bus will drop you off at any of the NSTA hotels and will return in reverse order on Sunday. Take the pain out of driving and have a social good time.

Time is short. You may also call Bob Briggs at 444-4439 to confirm a space.

MSTA Feature Article

Summer Science
Makes Dreams
Come True

Students of the **Canyon Ferry Limnological Institute** (CFLI) are making science history in Montana. Allene Whitney, who developed a quicker and easier test for toxic algae, was asked for a copy of her testing by the Minnesota Water Quality Bureau. Their state office plans to use it this summer. Her project, published in a government document, earned her one of the top 40 places in the National Westinghouse Science Talent Search and a trip to Washington, D.C.

She also placed second in the National Junior Science and Humanities Symposium in Florida and first place in the Montana Junior Academy of Sciences. This allowed her to present



her research at the National Junior Academy in San Francisco. Recently she received a personal letter from the Dean of Admissions at Stanford University congratulating her of her achievements. Allene's dream is to attend Stanford

University, and although the date for notification of admission is April, this letter is a positive sign of her reaching her dream.

Gwen Gray designed and constructed an electronic instrument for measuring water clarity and

submitted this project to the Duracell Competition and plans to enter it in the State Science Fair. Gwen also attended a DOE sponsored research opportunity in superconductivity at the Argonne National Laboratory last summer which resulted in a request for her to be a research assistant at the Brookhaven National Laboratory this summer.

Renee Doney, Alex Johnson, Tony Devoe and Allene Whitney were selected as delegates and to present their research at the 1989 Regional Junior Science and Humanities Symposium in Salt Lake City. Renee researched the Effect of UV beta radiation on reproduction of *Daphnia pulex*. Alex studied the effect of wood ash on *Daphnia pulex*. Allene refined her test

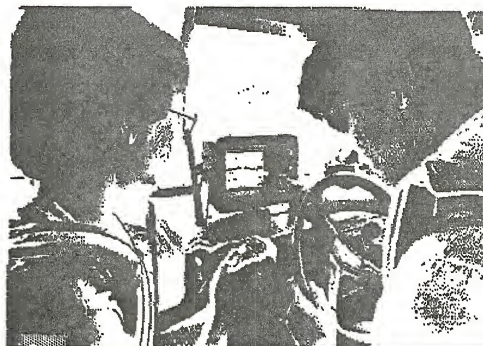


for algal toxins. Tony's study was on heterocyst formation in *Anabaena flos-aquae*.

Sara Satorius completed a map of the noxious weeds surrounding Canyon Ferry Lake

sponsored by the U.S. Bureau of Reclamation. She plans to enter her project in the State Science Fair. Her map will be used by the Bureau of Reclamation for determining areas for weed control.

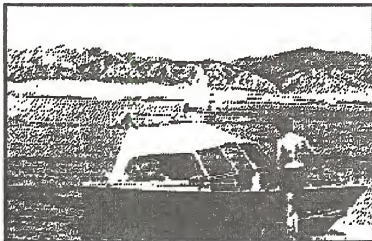
First year students at the



institute learn the basics of limnological field research and then plan their research for the following summer session. In last summer's session students learned field and laboratory analysis methods in the sciences pertaining to limnology, the study of freshwater. These supporting sciences included biology, chemistry, geology, topographic mapping and meteorology.

Elementary, middle school and high school teachers learn field and laboratory methods for studying limnology during the 10-day session for teachers

CFLI may offer a summer session for students completing the 8th grade this spring, if there is sufficient interest.

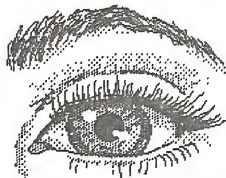


For more information contact the program directors:

Gil and Marilyn Alexander
Canyon Ferry Limnological Institute
504 Dearborn Avenue
Helena, Montana 59601
(406)443-2745

Science Process Skill: Inferring

by Kristy Bick



Inferring from observations is a hard process for the primary (and some secondary) students to figure out. Here is a good technique to help them.

With all the snow outside take your class out and go for a walk. Ask your students to infer from the footprints or tracks in the snow what was going happening at that location.

Was someone walking?

Were people playing?

Was a dog chasing another dog or cat or other animal?

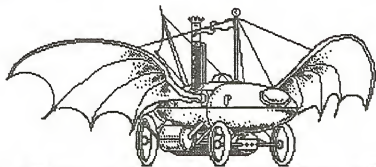
What clues are they basing their answers on?

Summarize after you come back to the classroom the importance of **OBSERVATION** in making inferences.



Transparency Maker No. 1

Human beings are
incredible model
builders. Language
itself is a model. And
all of us have a
tendency to confuse
our model of reality
with reality itself.



The Macintosh, Hypercard & Multi Hypermedia



Across the nation, educators are developing interactive, multimedia courseware for every discipline from art to biology to music. In Montana however, this development has been painstakingly slow. All but a very few teachers are aware of what can be done with the Apple Macintosh computer, the latest software called *Hypercard* and a videodisc player.

Since 1987, when Apple Computer, Inc. gave interactive media an enormous push with the introduction of **Hypercard**, any Mac or IBM user can easily develop multimedia courseware. Apple currently supplies every new Mac with Hypercard at no charge.

Hypercard is both a development system and distribution *player*. Users may choose to build their own customized Hypercard applications or run commercial *stacks*. A Hypercard-based Level III system includes a simple cable that connects the Macintosh (or IBM) to a serial videodisc player, any one of the ever increasing number of laserdiscs, the Hypercard program, and a color video monitor. The result is an inexpensive Level III delivery and authoring system for well under \$5000.

The basic concept behind this equipment is that text or graphics is not just a static computer screen output, but can be powerfully functional as well, linked to explanations, related ideas, remedial units, and everyday presentations. Adding a data display to a Mac for overhead presentations will provide you and your students with notes that cannot be surpassed!

Previously, the most widely

available implementation of branching and interactive presentation has been videodisc, which has made in-roads in training, education, and point-of-sale. With *Hypercard*, hundreds of thousands of people are gaining first-hand experience with hypermedia.

Numerous studies* since the early 1980's have showed that the videodisc benefits include higher achievement, reduced learning time, greater student motivation, and increased student confidence. Students liked learning at their own pace, ease of review, practice with feedback, and the visuals with motion.

If you would like more information on this system, contact me. Better yet, stop by the MSTa fall convention and watch me demonstrate its use.

Richard A. Menger, MST
Baker High School

**Interactive Video: Implications of the Literature for Science Education*, Eric E Smith & James D Lehman, *Journal of Computers in Mathematics and Science Teaching*, volume 8, number 1, fall 1988, pages 25-31.

The Classroom Applications of an Interactive Videodisc High School Lesson, Dorothy Stevens, Linda Zech, & Chandika Katkanant, *Journal of Computers in Mathematics and Science Teaching*, volume 6, number 3, spring 1987, pages 20-26.

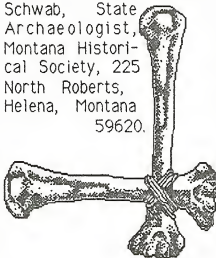


ARCHAEOLOGICAL PRESENTATIONS FOR MONTANA'S CENTENNIAL

The Montana Archaeological Association, with assistance from the State Historic Preservation Office of the Montana Historical Society, is acknowledging the 1989 Montana Statehood Centennial by arranging for professional archaeologists to give public presentations in communities across the state on topics concerning the archaeology of Montana. We believe that this would be an educational and enjoyable opportunity for members of your community to gain a greater knowledge and appreciation for Montana's archaeological resources and to meet active professionals in the field. Speakers will also be available to answer questions from the audience and examine any artifacts which people wish to bring.

We do ask that your organization cover the travel expenses and lodging cost, if necessary, for the speaker. We will try to obtain speakers from your local area whenever

possible to limit travel costs. The speaker's time and presentation fees will be donated at no charge to your organization. Fill out the form below to indicate your interest and one of our regional coordinators will be contacting you in the near future. Please send the completed format at right to Dave Schwab, State Archaeologist, Montana Historical Society, 225 North Roberts, Helena, Montana 59620.



Best Workshop

All expenses paid and a \$160 per week stipend! Eight graduate credits for teachers K-6. This is a fantastic program for elementary science teachers. Contact Elisabeth Charon, *Best Project*, Montana State University, Bozeman, Montana 59717. Call 994-3580 soon!

Speaker Form

Our organization would be interested in bringing a speaker from the Montana Archaeological Association to our community as a Centennial event.

Name of Organization: _____

Mailing Address: _____

Contact Person: _____

Telephone Number: _____

Preferred Date of
Presentation: _____

Is there space available to hold
the presentation? _____

Are a slide projector and
screen available? _____



**We must expect
each student to
strive for excellence
in terms of the
kind of excellence
that is within his
reach... John W.
Gardner**

NEW SCIENCE PROGRAM TO BEGIN IN SEPTEMBER

A new program designed to offer advanced study in the sciences and laboratory experience for high school juniors will begin September 1989 at Choate Rosemary Hall, Wallingford, Connecticut. Applications are being accepted for The Young Science Scholars Program.

Ten girls and boys will be selected for the pilot year of the program and spend the 1989-90 academic year living on the Choate Rosemary Hall campus. Students will have the opportunity to select courses involving, for example, the theory and techniques of nuclear magnetic resonance and electrophoresis. The courses will expose them to modern research techniques in such areas as recombinant DNA technology and environmental chemistry. Bristol-Myers Research Fellows, a distinguished group of scientists, will present seminars and serve as mentors to the scholars. In addition, students will also attend courses in the school's regular academic program.

Students in their sophomore year of high school may apply. Applications will be accepted throughout the spring and candidates will be informed of their status within three weeks. A full-tuition scholarship worth \$10,000 will be awarded to each student enrolled in the program. Financial aid grants for room and board are available for eligible students.

For more information contact Carolyn K. Hart, Director, Young Science Scholars Program, Choate Rosemary Hall, P.O. Box 788, Wallingford, CT 06492 or call (203) 269-7722.

Meteorological and Oceanographic SCIENCE TEACHER FELLOWSHIP

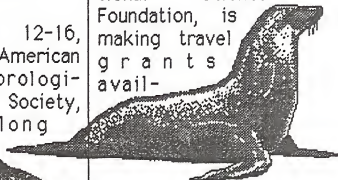
On July 12-16, 1989 the American Meteorological Society, along

with the Royal Meteorological Society of the United Kingdom and the World Meteorological Organization of Geneva, Switzerland, will cosponsor the Second International Conference on School and Popular Meteorological Education. The conference will be held at the Stouffer's Concourse Hotel, Crystal City, Arlington, Virginia. The conference is open to all interested in science education.

In order to promote atmospheric and oceanographic education, the Society, with support from the National Science Foundation, is making travel grants available.



Male



Female

Zalophus californianus
"California Sea Lion"



able to 100 science teachers of grades K-12 from across the United States. These grants (in amounts up to \$1,000) are to be used to pay the cost of transportation, food and lodging to attend the conference. If you are interested, call Bob Briggs (444-4439) immediately!

**National Radio
Astronomy
Observatory
SCIENCE TEACHER
FELLOWSHIP**

*Investigating the
Universe: Interactions
of Scientists,
Teachers and the
General Public*,
sponsored by the
NSF Institute, will
be offered June 18-
July 1 and July 30-
August 12, 1989.

Participants will
attend a two-week
summer institute at
the National Radio As-
tronomy Observatory in
Green Bank, WV, in a

full-time association
with astronomers,
engineers and science
educators. During the
academic year, par-
ticipants will prepare
investigations for
classroom use and for
demonstration in
public awareness
workshops. They will
attend area feedback
meetings, prepare as-
tronomy activities
for publication and, if
possible, arrange and
guide tours for stu-
dents or the general
public at the Green
Bank or other



Observatory during
the 1988-89 academic
year.

Approximately
\$40 per day will be
provided for the par-

ticipants. One round
trip from home to
Green Bank and two
round trips from home
to regional meetings
will also be provided.
Cost of lodging and
meals will be paid
directly to NRAO for
those participants
residing at Green
Bank. The lodging
portion will be given
to those participants
who opt to camp. Tui-
tion waiver for six
graduate credit hours
in science education
from West Virginia
University will be
granted.

Deadline for ap-
plication is April 15,
1989. Contact Bob
Briggs at 444-4439
immediately.

**Obstacles are
the things you
see when you
take your eyes
off your goals.**



NABT Looking for Nominations

The National Association of Biology Teachers, in conjunction with the textbook publisher, Prentice-Hall, annually sponsors a program intended to identify and honor an outstanding biology teacher from each state, Canada, and Puerto Rico. Each year, the recipient of this prestigious award is presented a framed certificate and a pair of World Class binoculars. An awards luncheon will also be held to honor the 1989 recipients at the National Association of Biology Teachers' Annual convention in San Diego, California, next October.

If you know of a biology teacher or a life science teacher (grades 7-12) who, in your opinion, is doing an outstanding job, won't you take the

time to nominate that teacher? Self-nominations are also welcome. The teacher need not be a member of NABT or any other organization to be selected. The overriding criteria are that they teach primarily life sciences and have demonstrated outstanding effectiveness, ability, inventiveness, leadership, and inherent strength in teaching the life sciences.

Craig Kuchel, Montana OBTA Program Director and teacher at Florence-Carlton School, 5540 Old Highway 93, Florence, Montana 59833 looks forward to receiving your nominations. We know there are many outstanding biology teachers in Montana. Please help to identify and reward them for their efforts!



Montana Tech and the NSF Announce Earth Science Summer Institute

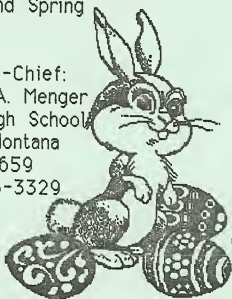
Supported by NSF's Project Partners, and Montana Tech, Geology 473 will cover topics such as mineral, rock, and fossil identification, rock cycle, topographic and aerial map reading, structural geology and volcanism, as well as state-of-the-art material on plate tectonics and surface ground water systems. The course will combine lecture, laboratory and field experiences, providing participants with materials they can apply directly to their classrooms. Participants can earn 3 semester credits and a \$400 stipend.

If you are interested, call Bob Briggs at 444-4439.

MSTA Board Members
and Regional Directors
Wishing You a Very Happy
Easter and Spring
Season !

Postage

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Montana Science Teachers Association

MSTA will help the individual participate in determining the destiny of science in Montana. The organization serves as a vehicle for educators from all professions to exert positive influences on young people. Many important decisions concerning the scope and direction of science education will be strongly influenced by our organization.

MSTA goals are to increase public awareness, interest and support of science education in Montana.



Membership Category:

1 year	\$ 10.00
2 years	\$ 17.00
3 years	\$ 24.00
Life	\$100.00
Student/Retired	\$ 3.00

Membership dues are \$8.00 and are payable to Gil Alexander, Treasurer, Helena High School, Helena, Montana 59601. Membership includes a one-year subscription (4 issues) to *The Montana Science Teacher*.